

# GRAIN YIELD OF DRY BEAN GENOTYPES SEVERELY AFFECTED BY HAILSTORM

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## INTRODUCTION

Common bean is the second most important crop in Mexico, after corn. During last five years, average of cultivated dry beans has been about 2.1 millions hectares, with a total production volume of 1.16 millions tons (1). This grain has played an important role in the diet of high percentage of people in our country. Nevertheless, average consumption has declined from almost 20 to 10 kg per person per year in a period of three decades. The main producing region of dry beans in México is known as the Highlands, which includes the states of Zacatecas, Durango, Chihuahua, Guanajuato, San Luis Potosi and Aguascalientes, where most of the cultivated dry beans is under rainfall conditions. Predominate climate at the Highlands is semiarid, with an average precipitation of 300 to 350 mm during the growth cycle. Thus, drought stress is one of the main limiting factors affecting grain yield. Another constraint that may reduce dry bean production is the occurrence of a hailstorm, which can cause severely damages in dry bean plants. Under this situation, farmers have to make a decision to maintain or eliminate the crop to sow again, mainly depending on the growth stage when hailstorm may occur. In this work, a group of 15 dry bean genotypes of different growth cycle was studied after being severely affected by hail to evaluate its recovery capability.

## MATERIALS AND METHODS

The study was conducted at the Experimental Station of Pabellón (22° 09' North Latitude; 102° 17' West Longitude; and an altitude of 1912 masl) located in Aguascalientes state, during the summer of 2008. Some soil characteristics of the experimental site are: Texture: sandy loam; pH: 7.5; Organic matter: less than 1.0%; Field Capacity: 20%; Permanent Wilting Point: 11%; Apparent Density: 1.4. Sowing date was June 19<sup>th</sup> and the following dry bean genotypes were included: Azufrado Tapatio, Flor de Mayo Bajío, Pinto Saltillo, P. Villa, P. Colobri, P. Ventura (early genotypes), Bayo Madero, B. Victoria, Blanco Español, Flor de Mayo Sol, Flor de Junio Victoria, Negro Altplano (intermediate genotypes), Bayo Criollo del Llano, Flor de Mayo M-38 and Tlaxcala-62 (late genotypes). Most of the cultivars were obtained at the dry bean genetic improvement program of INIFAP and have Type III habit (2). Experimental unit consisted of eight rows of 30 m long and 0.76 m apart. Precipitation was recorded at daily bases from a near meteorological during the growing season. At the end of the growth cycle the following traits were estimated in each genotype from four samples of two rows and 4.0 m long: aerial biomass, grain yield, harvest index ( $HI = \text{grain yield} / \text{aerial biomass}$ ) and weight of 100 seeds.

## RESULTS AND DISCUSSION

After 43 days of sowing date, a hailstorm occurred and caused severe damages to the bean plants, specially those early genotypes, because of its growth stage. Early genotypes were at preflowering and damages included broken branches and lost of flower bottoms. Plants of intermediate and late genotypes had not yet to initiated flowering, thus damages were only on the broken branches. This situation was used to evaluate the recovery capacity of the plants and to produce grain. Figure 1, shows the aspect of plants after the hailstorm and one month later, demonstrating that dry bean plants

were able to produce new branches and to produce (Table 1). However, a delay of about 30 days was observed in the maturity of all genotypes.



**Figure 1.** Dry bean plants damaged by the hailstorm at 43 days after sowing (A) and plants recovered a month later (73 days after sowing) (B).

**Table 1.** Growth cycle, aerial biomass, grain yield, harvest index and weight of 100 seeds observed in 15 dry bean genotypes severely affected by hail. Pabellón, Ags., México.

Genotype	Growth cycle <sup>1</sup>	Aerial biomass Kg/ha	Grain yield Kg/ha	Harvest Index (%)	Weight of 100 seeds (g)
Pinto Saltillo	E	5740	3640	63.5	35.9
Azufrado Tapatio	E	4355	2820	64.6	31.4
Negro Altiplano	I	4003	2360	59.1	24.1
Flor de Mayo M-38	L	3950	2290	57.9	28.7
Flor de Junio Victoria	I	4172	2250	54.0	31.5
Bayo Victoria	I	3081	1840	59.8	41.8
Bayo Madero	I	4508	1620	35.7	25.0
Tlaxcala-62	L	2611	1520	58.1	37.9
Pinto Villa	E	2821	1460	51.5	31.5
Flor de Mayo Bajío	E	2295	1440	52.4	24.3
Pinto Ventura	E	2617	1410	53.6	27.6
Pinto Colibri	E	2491	1340	54.0	29.3
Flor de Mayo Sol	I	2335	1300	55.7	25.3
Bayo Criollo del Llano	L	2706	1060	43.9	27.5
Blanco Español	I	1643	860	52.0	32.9

<sup>1</sup>E = Early (40-45 day to flowering; 85-90 days to maturity); I = Intermediate (45-50 day to flowering; 90-95 days to maturity); L = Late (50-55 days to flowering; 95-100 day to maturity).

## REFERENCES

- 1) Web page: [siap.sagarpa.gob.mx](http://siap.sagarpa.gob.mx). Consulted March 12<sup>th</sup>, 2008.
- 2) Rosales-Serna R., et al., 2004. Variedades mejoradas de frijol del Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias. Libro Técnico No. 6.